CALIFORNIA DIVISION OF MINES AND GEOLOGY

Fault Evaluation Report FER-8

March 28, 1977

1. Name of fault: More Ranch Fault.

2. Location of fault: The More Ranch fault is located on the Santa Barbara and Dos Pueblos Canyon quadrangles in Santa Barbara County (see figure 1).

3. Reason for evaluation:

This fault is located in the ~~first year's~~ 1976's study area of the 10-year program for fault evaluation in the state.

4. List of references:

a) Dibblee, T.W., 1966, Geology of the central Santa Ynez Mountains, Santa Barbara County, California: California Division of Mines and Geology, Bulletin 186, 99 p.

b) Moore and Taber, 1974, Santa Barbara County comprehensive plan -- Seismic Safety Element, 93 p.

c) Dames and Moore, 1973, Geology and seismology of the preliminary safety analysis report, University of California Santa Barbara reactor site, 42 p.

d) Willott, J.A., 1972, Analysis of modern vertical deformation in the western Transverse Ranges, California: M.A. thesis, University of California Santa Barbara, 81 p.

e) Jennings, C.W., 1975, Fault map of California: California Division of Mines and Geology, Geologic data map series, Map no. 1.

f) Sylvester, A.G., 1976, Personal communication of March 24, 1976.

5. Summary of available data:

a. Location and description - The More Ranch fault, as mapped by Dibblee (1966), is about 9.5 miles long and strikes nearly east-west (see figure 2). The fault extends from the Ellwood oil field on the west to Laguna Blanca on the east, where it merges (?) with the Mission Hills and Mesa faults (see figure 1). The fault is vertical or steeply dipping to the south. The south side is up relative to the north. Dibblee estimates that the base of the lower Pleistocene Santa Barbara Formation is offset 2000 feet. Also, the late Pleistocene terrace materials at the west end of the fault have been offset two feet (Dames and Moore, 1973).

Dames and Moore (1973) show the fault in nearly the same location as Dibblee. However, they show a south branch of the fault extending west from Mescalitan Island to the coast 0.8 miles from Coal Oil Point. They state that the fault offsets the base of the Pleistocene terrace deposit at the coast. The south branch was also revealed in trenching on the U.C. campus. However, no trench logs accompany the report and the logs could not be located in the company files.

b. Recency - At the west end of the More Ranch fault, Dibblee shows the fault cutting older alluvium (Locality 2, Figure 2). North of Devereaux Ranch, Dibblee shows an inferred fault cutting Holocene alluvium (Locality 6, Figure 2). Elsewhere, the fault is concealed beneath alluvium. Moore and Taber (1974) classify the fault as active (i.e. Holocene) based on Dibblee's work. However, in Dibblee's (plate 4) cross section C-C', he clearly shows that the fault does not cut either older alluvium or younger alluvium.

Jennings (1975) shows the fault to be possibly creeping north of Coal Oil Point. Sylvester (1976) stated that this was due to poor survey techniques carried out by students at U.C. Santa Barbara in a first order leveling survey done across the fault. There is no other evidence for fault creep.

A first order leveling survey of benchmarks was done in 1960 and again in 1971 by the U.S. Coast and Geodetic Survey along the Southern Pacific rail line. This data indicated local elevation changes along the rail line. Willott (1972) states that no significant changes occur along the line in the vicinity of the More Ranch fault. However, the fault and the surveyed line do not cross one another.

6. Interpretation of air photos:

The only aerial photos interpreted are 1972 U-2, false color IR, at a scale of 1:125,000 (approximately 1" = 2 miles). Small topographic features along the mapped trace of the fault could not be seen, if they exist. However, the mesa located on the south side of the fault could be seen. The fault, as mapped by Dibblee, follows the edge of this escarpment. On the west side of the fault (where it crosses older alluvium), a possible fault related scarp was seen. However, this feature was located on a golf course and could be man made or modified.

7. Field observations:

Very little evidence related to surficial features was observed along the More Ranch fault. The localities of significance are described below (see figure 2):

Locality 1) The cliff exposes the well-bedded, generally east-west striking strata of Monterey Formation. The rocks are shown by Dibblee to dip to the south on the south side of the east-striking fault and to the north on the north side of the fault (partly verified). The only fault observed in the cliff exposure cuts Monterey rocks and strikes N 48° E and dips 50° SE (see figure 3 for photo and accompanying sketch). The fault stratigraphically offsets the base of the overlying Pleistocene terrace deposit about four feet. As can be seen on the photo in figure 3, the fault's dip becomes more gentle upward and is nearly horizontal as it nears the top of the cliff. However, closer observation of the terrace materials show that the fault dies out before it reaches the surface soil horizon. The base of the overlying topsoil unit clearly is not faulted. This fault, since its strike is about 45° from the strike of the main More Ranch fault, is probably a minor feature.

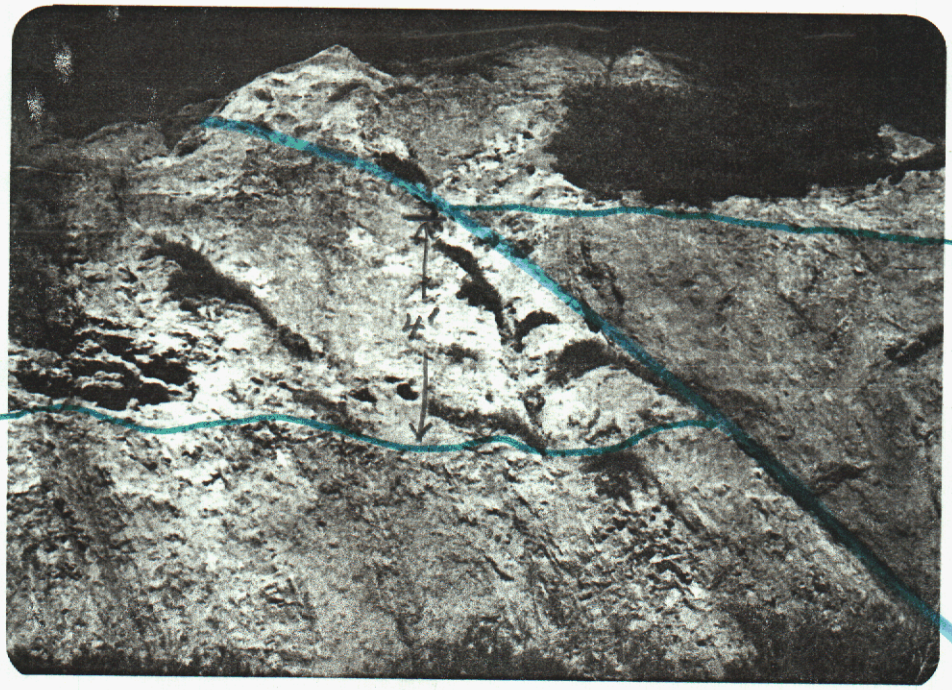
Locality 2) Dibblee describes a low, north-facing scarp in older alluvium at this locality. This scarp is about four feet high. The scarp lies within a golf course and may have been modified or created by grading. It could not be determined if the observed scarp is natural. However, if this feature were due to faulting, the top of the terrace exposed in the cliff at locality 1 should have been offset about four feet and this is not the case.

Locality 3) In an attempt to find the south branch of the More Ranch fault identified by Dames and Moore, a thorough inspection of the seacliff was made from Coal Oil Point westward for about three miles. At

FER 8

Fig 3

View looking NE shows terrace - Monterey Formation contact offset about 4 feet.



locality 3 a bedding plane fault was found in the Monterey shales which strike N 65° E and dip 60° to the southeast. The overlying terrace materials do not appear to be disturbed.

Locality 4) Between localities 3 and 4 there are many bedrock faults in the Monterey and Sisquoc Formations. None of these faults appeared to disturb the overlying terrace deposits. At locality 4, a bedding plane fault was seen in the south-dipping, Pliocene Sisquoc Formation of Dibblee (1966). Its age cannot be determined more precisely than post-early Pliocene as no units younger than the Sisquoc Formation are exposed here.

Locality 5) The fault, as mapped by Dibblee, lies within 100 feet of the north edge of the mesa at this locality. However, no faults were observed in either the younger alluvium or the Santa Barbara Formation exposed in a roadcut.

8. Conclusions:

The north (main) branch of the More Ranch fault is fairly well-defined in the subsurface (Dibblee, plate 4), but is mostly covered by Holocene alluvium or obscured by development at the surface. Its general trace is probably defined by the north-facing escarpments of the uplifted terraces (locally referred to as "More Mesa") at localities 2 and 5. None of the escarpments have been evaluated by any subsurface method to determine if they are fault related or have another origin. Cliff exposures at locality 1 reveal only minor offest of the base of the terrace deposits. The overlying soil is clearly not faulted.

The south branch of the fault is less well-defined in the subsurface (and is not identified by Dibblee). It could not be clearly identified at the surface except in the Dames and Moore trench and, perhaps in the numerous minor faults exposed in the bedrock between localities 3 and 4.

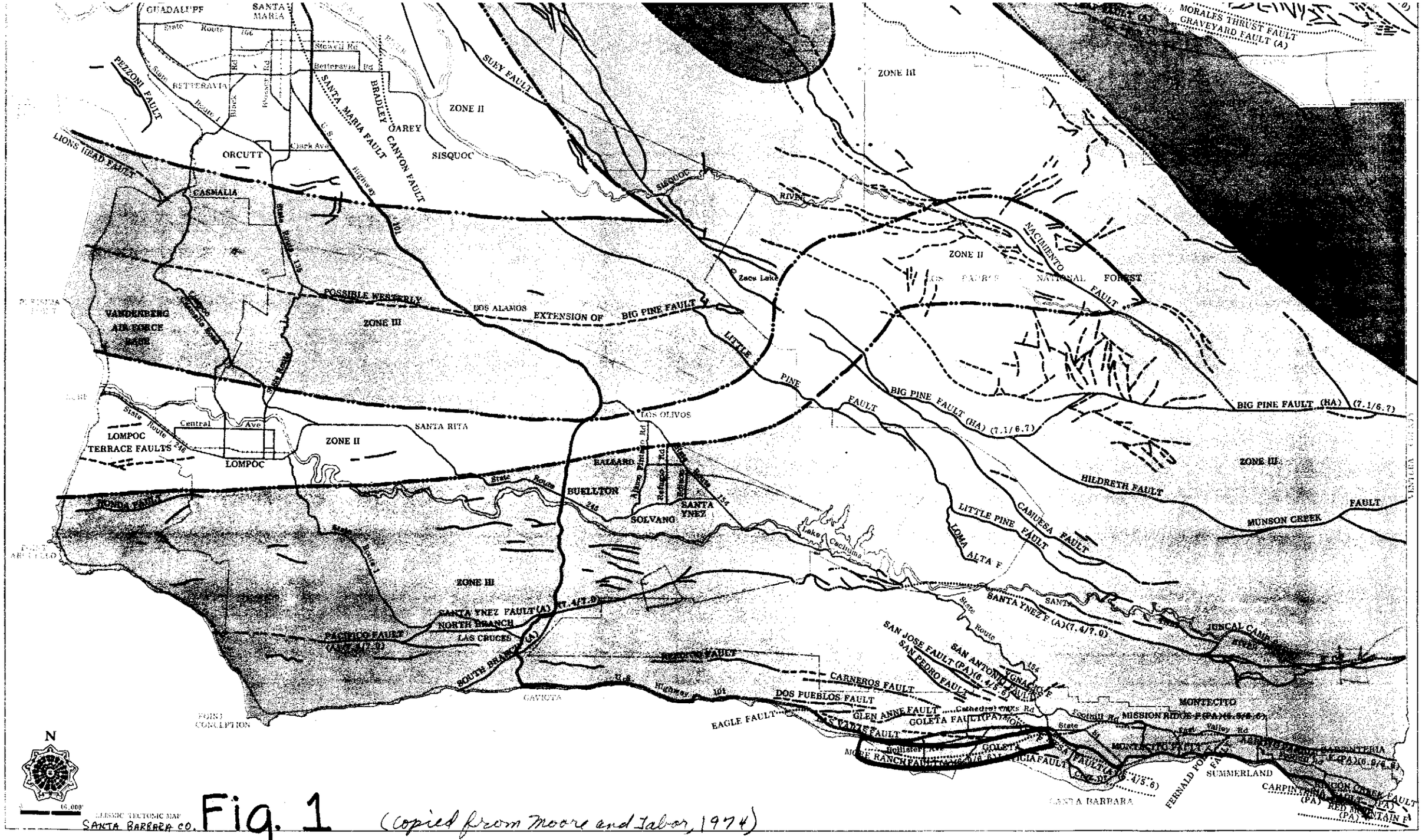
9. Recommendations:

The More Ranch fault does not appear to be sufficiently active nor is a well-defined feature at the surface. Therefore, I recommend that it not be zoned for special studies at this time.

10. Investigating geologist's name; date:

EDWARD J. BORTUGNO
Geologist
March 28, 1977

I concur with this recommendation
Edbt
3/31/77



CLASSIC TECTONIC MAP SANTA BARBARA CO.

Fig. 1 (copied from Moore and Jahns, 1974)

FEB 8